CKJG Technical Updates

Cawangan Kejuruteraan Jalan & Geoteknik

Bulletin on lessons learned in
- Road Safety
- Road Engineering
- Geotechnical Engineering

Theme of the month:
PAVEMENT PERFORMANCE

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PAVEMENT RESURFACING… "HOW SOON WILL IT RECRACK!!!"

This technical note describes the performance of 40mm thick asphaltic concrete overlay normally used to resurface paved roads in Peninsular Malaysia. A model has been developed that predicts the effectiveness of the 40mm overlays as a rehabilitation technique based on the conditions of the pavements before overlay (in terms of crack intensity and pavement deflection) and the traffic flow after the overlay. The results indicate that the overlays tend to recrack in no time and that they are only partially successful in preventing cracks propagating through the overlay even if it is laid on good existing pavements.

1.0 Deterioration of the overlays

The surface condition surveys of a road pavement regularly carried out after a road has been resurfaced revealed that the overlays normally tend to deteriorate in the form of cracking. The intensity of the cracking is normally categorised as follows:

- Single crack
- Multiple crack – not connected
- Multiple crack – interconnected
- Crocodile cracking

Single Crack Multiple Crack Crocodile Crack

A study was carried out to investigate the cracks which appeared on the new overlays to determine the cause of the problem. Site investigations carried out by coring through the cracked pavements that are visible at the pavement surface indicate that the cracks had reflected through the new overlays from the old surface. This phenomenon is normally termed *reflection cracking.*

Treatment of the cracking using crack sealant prior to overlay

2.0 Probability of existing cracks reappearing

Figures 1 and 2 are typical plots illustrating the probability of newly resurfaced road undergoing reflection cracking with traffic (in terms of commercial vehicles) for various categories of initial cracking and levels of deflection.

The figures show that the onset of reflection cracking is rapid and illustrate its dependency on the initial condition and the strength of the existing pavements.

The percentage area of the resurfaced pavements recracking is briefly summarised in Tables 1 and 2. As an example, Table 1 illustrates that 50% of the pavement area tend to recrack after a passage of 2 million commercial vehicles on a good existing pavement having single cracks compared to only 0.75 million commercial vehicles required for a weaker existing pavement. It also indicates that lesser commercial vehicles are required for the same percentage of cracking if the resurfacing is on pavements with interconnected cracks.

3.0 Discussions

This study shows the effectiveness of 40mm thick asphaltic concrete overlays, as a means of rehabilitating existing road pavement which are cracked. The results of this investigation have shown that cracks in the existing surface reflected through the new overlay in a relatively short period of time.

The rate at which the cracks reflect depended on the type of cracking and the magnitude of the pavement deflection prior to overlay, and the cumulative flow of commercial vehicles after the construction.

The effect of crack types on the probability of cracking is more distinct on roads with low deflections. Where the deflections were high, the pavements tended to crack within a short period of time, with the effect of crack types being less prominent.

The results of this study show that the use of 40mm overlays to rehabilitate roads with interconnected cracks is **ineffective.**

It is found that

a) On roads with a daily traffic flow in excess of 1250 commercial vehicles, over 50% of the pavement will crack within two years, even at low deflections.

b) For roads with deflections over 1.0mm, the 40mm overlays are similarly ineffective irrespective of the level of cracking.

4.0 Conclusions

It is therefore recommended that 40mm thick overlays are not used on roads with interconnected cracks unless the cracks are treated prior to overlay. Similarly, all cracks should be treated prior to overlay if the initial deflections exceed 1.3mm using the Falling Weight Deflectometer under a loading pressure of 700 kPa.

5.0 Recommendations

It is strongly recommended that all resurfacing and rehabilitation work must be designed based on the existing surface condition and deflection values.

Deflection (mm)	Commercial Vehicles (CV) (10^6)	
	Single Crack	Multiple Crack
0.5	2.0	0.9
1.5	0.75	0.5

Table 1: CV required for 50% crack

Deflection (mm)	Percentage Crack (%)	
	Single Crack	Multiple Crack
0.5	20	60
1.5	60	70

Table 2: % crack for 1 million CV

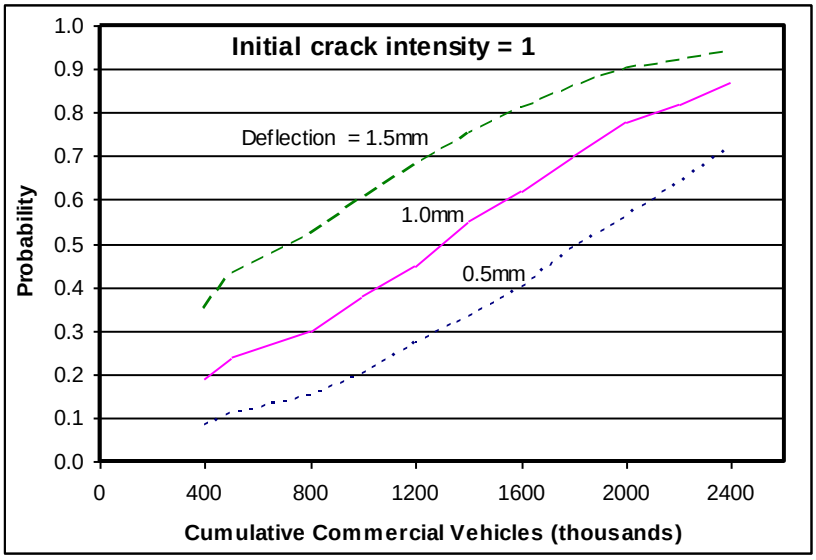

Figure 1: Probability of cracking (Single Crack)

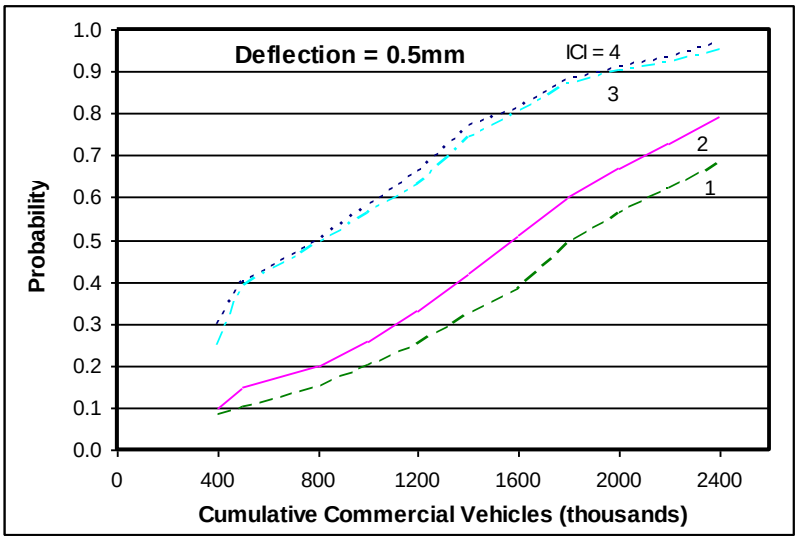

Figure 2: Probability of cracking (Deflection = 0.5mm)

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